A Historical Overview Of Grenada`s Nutmeg Sector

By

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Characteristics of the Nutmeg Plant

The Nutmeg plant is a member of the Myristicaceae family of which the basic genus is Myristica. .The main species cultivated are Myristica fragrans sometimes referred to as the Banda nutmeg and to a lesser extent Myristica argenta,also called the Papuan nutmeg.It is believed that the centre of origin of this species is New Guinea,while Myristica fragrans originated in the Moluccas(Indonesia).The species grown in Grenada is Myristica fragrans.(1)

The Nutmeg plant exhibits variability in its sex expression in that in a seedling population it is possible to have both female-only flowering plants and male only flowering plants segregating in 1:1 ratio.and bi-sexual treesThe latter can be subdivided into three different groups,e.g bisexual males,,true bisexuals,and bisexual females.This feature was also observed at the Mirabeau Nurseries ,Grenada, in a plot of Myristica fragrans seedlings,the seeds of which were imported from Malaya in 1959.Prior to this ,the occurrence/identification of bisexual flowers in the local population of Myristica fragrans was a rarity.Therefore given this variation in the flowering habit of this species outlined above by Flach(1).it might be safer to say that except for unisexual female and unisexual male plants,Myristica fragrans is incompletely dioecious.In addition, it is slow growing,and it is difficult to propagate vegetatively.(2)

The dissemination of the Nutmeg plant from its centre of origin

The English word Nutmeg comes from the Latin nux meaning nut and muscar,meaning musky.The Roman author Pliny in the first century A.D speaks of a tree bearing nuts with two flavours.According to J.R.Groome(3),Nutmeg appeared in Europe by the end of the 12th century,and Henry VI of the Holy Roman Empire is said to have entered Rome in 1195 for his Coronation by having the air of the streets sweetened with incense of burning nutmeg and aromatic herbs.The nutmegs must have been brought overland by Arab Traders from the Far East,their exact origin being unknown in the west until 1512 when the Portuguese found the plants growing in the Banda Islands of the Moluccas.

The Dutch annexed the Banda Islands at the beginning of the 17th century retaining their hold on them except for periods of British rule.They established a nutmeg monopoly which was jealousy guarded,and waged a bloody war including the massacre and enslavement of the inhabitants of the Banda islands in order to control nutmeg production in the East Indies.The French attempted to break this monopoly in 1769 and Frenchman Pierre Poivre organised a clandestine expedition to the least frequented parts of the Moluccas from where he was able to transport several thousand nutmeg plants to Mauritius and Cayenne.The effort was not particularly successful at either location.The British in their second interregnum also sponsored a visit in1796 to the Moluccas by personnel of The British East India Company to collect nutmeg seeds for planting on Penang Island .Other plantings were attempted with varying success in Calcutta and Madras.By 1812 nutmeg was developing into a major crop in Penang as well as Sumatra and Singapore a few years later.These developments were intended to break the Dutch nutmeg monopoly.By 1824 a curious link had developed between the East Indies and the West Indies,when Agriculturists from some W.I.Territories were recruited to assist in the development of the Sugar Industry of the East Indies. Some of these Agriculturists returning home on leave or retirement would therefore have brought back nutmeg seeds to the region.It is alleged that one of the first trees to be planted in the Trinidad & Tobago Botanic Garden in 1824 was a nutmeg plant from St.Vincent. It has been positively stated that the first nutmeg planted in Grenada was on Belvidere Estate in St.John`s Parish, with seeds brought from Banda in 1843 by Frank Gurney.Belvidere Estate was owned in 1824 by Thomas Duncan,one of the Landed Gentry who owned a few other Estates in the Parish.Frank Gurney seem to have had some connection with the Hankey Family of Britain and the firm of Thompson Hankey and Co who have been engaged in Agricultural,Financial and Commercial activities in Grenada from about 1720 to 1964 (4). (It is interesting to note that Julien Fedon, the French Creole who led the Fedon Rebellion in 1795-1796,was a previous owner of Belvidere Estate.It was here he kept some 51 captured British prisioners at his"Camp Fedon" including the Governor,who together with 47 of them were executed.Only three were pardoned.Grenadian returnees from the East Indies subsequently would also have brought back nutmeg seeds for planting,and the names Lessey and Munro were associated with Bellevue and Capitol Estates in St.Andrew`s Parish,which were alleged to be the first commercial nutmeg plantations in Grenada.The Bell family in 1778 owned part of Capitol which they called Penang Estate, presumably planted with nutmeg seeds from Penang(3).Both Capitol and Penang Estates were subsequently owned by Sir William(Willie) Branch who died in 1993.

Grenada was under French rule on several occasions and it is only natural that many place names are of French origin .For example, the Town in StJohn`s Parish was called "Gouyave"After the island was returned to Britain by the Treaty of Versailles,the name was changed to Charlotte Town in 1763, in memory of Princess Charlotte of Wales,daughter of George IV.However the area in the North Western section of the Parish in the environs of the area known today as the L`Anse,was unofficially called "Duncan Town" by the residents in honour of the Duncan family who not only was associated with the first nutmeg plantings in Grenada at Belvidere Estate, but were also the owners of extensive land holdings in the Parish.To avoid the double name confusion of the Town,both names were subsequently ignored and the Town, unofficially, has reverted to the French name of Gouyave.

The development of the Nutmeg Sector and the establishment of The Grenada Co-operative Nutmeg Association(GCNA)

The collapse of the West Indian Sugar Industry also severely affected the local sugar estate owners many of whom were forced into bankruptcy,while others hastened to convert their estates from sugar to cacao.In fact the death of the local sugar industry heralded the birth of the cacao industry (5). The Nutmeg Sector apparently did not receive the same enthusiasm as the Cacao industry ,and its development was therefore much slower.It however received a fillip in 1851 when plantations in Penang and Singapore were alledgedly decimated by an insect pest.The local farmers became aware of this disaster and began planting nutmeg seriously in 1860.It is said that Belvidere estate the site of the first nutmeg planting did not achieve an economic level of production until about 1880(3).World production was low during this period and the first recorded export from Grenada was some 50 tons of spices(nutmeg and mace) in 1881,while in 1900 some 294 tons of nutmeg and 40 tons of mace were exported.By 1909 ,the export value of nutmeg was given as 12,000 pounds sterling and mace as 6,200 pounds sterling.In1919,some 10 years later,the export value of each crop increased appreciably.Nutmeg export was valued at 54,280 pounds sterling,while mace export was valued at 14,200 pounds sterling.In 1925 nutmeg exports totalled 1,100 tons and mace 192 tons.The Grenada Handbook of 1946 recorded the following (6);-"The year 1925 proved to be one of the most prosperous in the history of Grenada.All the principal crops were greater in volume than in the previous year and the increases in quantity occurred in a period of greatly enhanced prices.Especially was this so in the case of the nutmeg crop and its derivative mace."This favourable situation continued up to 1928 and beyond to the point where world supply exceeded demand followed by a decline in prices.

Before the establishment of the GCNA,the marketing of nutmeg and mace was handled solely by a number of Exporters who purchased these commodities from the farmers.Some of these Exporters were also nutmeg producers and ultimately became members of GCNA.They are identified in the following list.. by an asterisk *

A Hubbard & Co. Ltd
The St.John`s Produce Co

Dougaldston Estate *
W.E.Julien & Co.Ltd
Geo.F.Hugginns & Co.(Grenada) Ltd.
Thompson Hankey & Co.
V.E.Clarke & Co
Mc Cartney & Williams
L.L.Ramdhanny *
Norbert Nyack *
P.G.Hosten *

The idea of forming a Nutmeg Co-operative came from Norman Gay,owner of Brothers Estate in St.John`s Parish(7).(The Estate was wound up some years ago and today it is the site of The St.John`s Christian Secondary School).GAY convinced some of his colleagues in 1942 of the critical need for a marketing co-operative which among other things would eliminate the competition between the exporters, stabilise prices paid to the producers,and enhance the export quality of Grenada`s nutmeg and mace.This proposal went through an official route which took it first to the Office of the then Governor.Sir Arthur Grimble,next the Secretary of States for The Colonies ,then on to the Legislative Council, subsequently culminating in The Nutmeg Industry Ordinance,No.8 of 1946.The birthday of the GCNA is however 27th March 1947,and it started business on the 1st October 1947. By virtue of Ordinance No.8 of 1946,it became the sole exporter of nutmegs,and although Exporters were eligible for membership in the Association,the advance they received for nutmeg purchased from producers was less than that paid to those making direct sales to the Association.This was unsuccessfully challenged in the Legislative Council by those members who were thought to be friends of the Exporters.

The sequel to this was the formation of an Exporters opposition group calling itself “The Grenada Producers Protective League”who continued the antagonism against the GCNA, by seeking legal opinion to challenge its export monopoly. Between 1951 and 1975 three Commissions of Enquiry were appointed by Government as follows:-

(A)	The Jackson Commission Of Enquiry				(April 1951)
(B)	The Ward	“	“	“	(Sept. 1971)
(C)	The Dennison	“	“	“	(Oct. 1975)

Commissions (A) and (B) apart from generally investigating various aspects of the management of GCNA and making recommendations for improving its operation,it is noted that one of the recommendations made by Commission(A) to Government was :-“The continuation of the Monopoly position of the GCNA in receiving and processing nutmegs”This settled the major issue between the Exporters and the GCNA.Commission(C) dealt mainly with the legality of an Act of Parliament to dissolve the elected Nutmeg Board and create an Interim Board.as well as the financial management system of the Association.

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Nutmeg Plant Propagation,Field Establishment and Management

From the year of the introduction of the Nutmeg plant to Grenada in1843 up to 1956,the year after Hurricane Janet, a period of some 113 years,the propagation and planting of nutmegs in Grenada was by seedlings.The seeds were either directly planted at stake in the field or pre-germinated and planted when the seedlings were at least 12” ins tall The dilemma faced by the farmer was the 5-8 years it took before the plant flowered and declared its sex whether male or female.The males plants were destroyed except for one or two to ensure pollination.

The Nutmeg Sector unlike other tropical crops like cacao,sugar,bananas or even citrus, has not attracted any significant research effort in the Region.It was therefore the 1955 Hurricane which destroyed about 80% of the Nutmeg plantations, threatening the farmers and the country with economic ruin, that stimulated interest in the development of a vegetative propagation technique for Nutmegs.The first objective was to find a “rapid”method to quickly rehabilitate the sector with such plants, which also had the added advantage of knowledge of their sex prior to planting.Experiments were conducted with the following techniques:-

(a) Shield Budding

Unsuccessful trials were made in 1956 to shield bud young nutmeg seedlings about ½ inch in diameter in the collar region.

(b) Approach Grafts.

Potted seedlings about 18 inches tall and about the thickness of a pencil in the collar region were approach grafted to scions(twigs)of similar thickness by removing thin sections of the bark (about 1.5 inches long) from both stock and scion, and then taping them together.The grafts took about four month to unite.To obviate the possibility of stock-scion incompatibility,grafting was done as low as possible,and the base of the severed scion was treated with a rooting hormone prior to planting ,to stimulate production of its own root system. A 40% success was achieved with this technique and some 2800 grafted nutmeg plants,equivalent to 60 acres were distributed.

(c) Rooted Cuttings.

Nichols.(University of The West Indies) & Cruickshank.A.M. .Ministry of Agriculture Grenada found that semi-hard wood cuttings treated with a 0.5% IBA hormone solution and a second treatment 8 weeks afterwards,stimulated root production in about 4 months. However a further 3 months was necessary to develop a good root system.(8)

Subsequent work by A.M.Cruickshank ,Agronomy Division,Ministry of Agricultute . Grenada, indicated that the period can be reduced by 2 months using semi-hardwood terminal cuttings about 18 ins tall and treated with a Rooting Hormone called Seradix L.15.However rooting efficiency was about 10-18%,and the rate of growth in the field was particularly slow as compared to Marcots and Approach Grafts (9).

(d) Marcots

The technique of Marcotting or Air Layering is essentially inducing a Nutmeg branch or twig to produce roots while still attached to the tree.Branches 1/2”-3/4” in diameter are selected and a longitudinal split about 2 ins long is made in the middle of the stem about 3 feet from the tip of the branch.To maintain its rigidity ,a bamboo splint is placed on the lower side of the split and tied at both ends.A section of the split branch is removed with a secatuer.The upper cut end is then lifted and a splinter of hardwood is inserted to keep them apart. A rooting hormone(Seradix L.15) is applied to the cut end to which moist peat moss or saw dust is applied and tightly wrapped with plastic.After rooting,it takes about 42 weeks or about 10 months to produce a marcotted plant fit for planting.Between 1957 and 1962 a total of 14,564 plants were distributed,equivalent to 300 acres. By 1980 when the program was terminated,a total of 1000 acres were planted.

History has a way of repeating itself and the Nutmeg Sector in 2004/2005 when about 90% of the nutmeg plantations were destroyed by Hurricanes Ivan and Emily,was in a similar position as in 1955 when the level of destruction by Hurricane Janet was estimated at 80%.This provided an opportunity to address the age old problem that farmers wishing to participate in a Nutmeg Sector Rehabilitation Program, had to use seedling plants and wait 6/7 years until they declared.To solve this problem,The Agronomy Division of The Ministry of Agriculture in 1956 experimented with the different vegetative propagation techniques indicated above.The objective was to produce a female nutmeg plant vegetatively, which would fruit at an earlier age than the seedling would take to declare.Success was achieved with Approach Grafting and Marcotting,but it was obvious from the long time it took to produce either one for planting , that mass production was not possible.In an observation plot planted in 1967 to compare the performance of nutmeg marcots and seedlings of similar age, all the marcots had flowered within three years,while by the fourth year, only 30% of the seedlings had declared , half of which were males.

As a vegetatively produced plant, a Nutmeg marcot has what is know as an adventitious root system which develops as a fibrous mass growing out laterally from the base of the plant.A Nutmeg Seedling on the other hand has a tap root which emerges from the seedling on germination and grows down vertically into the soil.Thus in 2008 when a program to introduce the Epicotyl Grafting Technique of Nutmeg Seedlings was announced,some farmers were quite elated,and it was said that this program would create a revolution in the sector.Short female trees will be produced ,the root system would penetrate the soil to an appreciable depth,enabling the plants to withstand Hurricane force winds.If this were totally true ,then these plants with their tap root system would have had a significant advantage over Nutmeg Marcots.

Although a nutmeg plant may still be producing a few pods up to about 80 years,its most productive stage is between 15 and 30 years.Its taproot would have been disintegrated by then ,and replaced by a fibrous lateral root system down to a depth of about three or four feet.Some of the underground lateral roots can extend even further than the spread of the tree This is the reason why farmers would have observed the absence of a tap root in all the fallen nutmeg trees after Hurricanes Janet in1955 and Ivan in 2004.The top of a nutmeg tree is heavier than the bottom,therefore both Nutmeg Marcots and Nutmeg Seedlings are likely to be blown down even by Gale force winds of 39 to 54 miles per hour,and definitely by Hurricane force winds of 74 miles per hour.The old farmers in the past were aware of this,and protected their nutmeg holdings as far as possible with a system of windbreaks planted at right angles to the prevailing winds.Unfortunately with the break up of the Plantation system,most of these were cut down and burnt for charcoal..

Epicotyl Grafting (10) is new to Grenada and local Technicians in The Spice Research Program were trained in the technique by an Indian Expert.An immature nutmeg seedling(the stock) is grafted in its epicotyl stage before the seedleaves expand, first by severing the top horizontally about 2”-3” above the junction of its root and shoot.A vertical cut about 2”-3”long is then made centrally in the stem.A semi-hardwood shoot with four leaves(the scion)is selected from a female tree with “elite germplasam” (e.g large nuts,thick mace,high levels of myristicin etc)The cut end is shaped in a chisel point and inserted in the vertical cut of the seedling stock and taped firmly with 100 gauge(0.50cm) polystrip .The plant is then subjected to a high humidity regime including protection of the plant from wilting for about 50 days until sprouting begins,This is followed by potting ,taking care to avoid covering the graft union.Plants should be stored at an ambient temperature of 30-32 degrees centigrade and watered every two days. They are then shifted under 50% shade for further hardening and the development of shoots and leaves until they are 15 inches tall. It takes about 8-9 months to produce an epicotyl graft fit for planting .

Epicotyl Grafting has been temporarily suspended and there are some 275 plants fit for planting on the storage floor.It is proposed to establish three demonstration plots with these plants to observe their performance in the field and distribute others to farmers at the start of the 2012 Planting Season.Propagation work currently in progress involves patch budding young male plants with budwood from "elite" female trees to effect a" sexual transformation" of male plants to female plants.

The current system of nutmeg plant establishment and field management in Grenada leaves a lot to be desired . Some of the deficiencies are as follows:-Poor site selection,irregular planting distances,planting holes not properly prepared, absence of shade and windbreaks,plants are not pruned nor fertilised etc

The Regional Research Centre of The Imperial College of Tropical Agriculture,(now The Faculty of Agriculture of The University of The West Indies) conducted a "Soil and Land Use Survey of Grenada"in 1959(11) and producedis a very informative report.In the absence of any subsequent soil survey of Grenada,it behoves the Landuse Division of The Ministry of Agriculture to interpret the data in this document(whch may be gathering dust in The Ministry) and relay the findings to The Extension Staff to assist the Farmers particularly in site selection and optimum land use.Included are:-,Maps of The Mean Annual Rainfall,Humidty,Drainage.and Natural Vegetation.Symbols are used to identify a demarcated area,e.g.In the symbol 40D2. the number 40 In the first part of the symbol is keyed in the map legend for the name of the soil type e.g Belmont Clay loam.The second part is a letter which designate slope classes A,B,C,D.E.F,with increasing slope gradients.The figure in the third part of the symbol describes the stages of erosion :- + = an area of accretion, 0 = no apparent accretion or erosion,1=slight erosion increasing up to 5, which is extremely severe erosion

The Survey identifies the following soils which may be considered suitable for Nutmeg/cacao cultivation:-

Red soils mainly over deeply weathered basic igneous rocks("Red Earths")
Moderately to well drained.

30. Capitol Clay Loam
31. Capitol Clay Loam(stony and bouldery phase)

Brown soils mainly over ash or agglomerate('Brown Earth")
Well drained mainly in areas of good rainfall

40 Belmont Clay Loam
41 Belmont Clay Loam(Stony and bouldery phase)

Both soils are moderately to well drained with good water retention and are moderately erodible.They are of considerable extent,but the Belmont Clay loam has higher natural fertility and is on relatively gentle slopes In addition, they are located in hilly and mountainous locations. Nutmegs should be planted on either of these soils in areas with an elevation of 700ft-1200ft, experiencing a mean annual rainfall of 80-100 inches.Windswept areas should be avoided,and the existence or establishment of windbreaks are advantageous in minimising windstorm damage.If preliminary approval of the site has been given by the Area Extension Officer,Banana shade establishment should commence as well as Soil Conservation measures where necessary

. If these operations are completed to the satisfaction of the Area Extension Officer,the site should be lined as follows:-

(a) On hillsides – Plant in a row across the slope on the contour 25ft apart and

40 ft between the row .e.g 25ft x 40 ft,(approx 43 plants/acre)

(b) On flat or undulating lands—Plant on the square 30 ftx30ft.(approx 48 plants/acre) Planting holes should be dug not less than 2 ftx2ft,and the soil mixed with a basket of Pen Manure and about ¾ lb of Triple Superphosphate.

Planting and Aftercare;-Avoid damaging the tender roots by carefully removing the plant from the potting bag.Plant should be established under 50% shade, followed by mulching and staking.Shade also acts as a buffer against unfavourable and poor conditions and can be gradually reduced until it is completely eliminated after about seven years(12) as follows :-

Plants up to 2 years 50% Overhead shade
“ “ “ 3-4 years 40% “ “
“ “ “ 4-5 “ 30% “ “ plus ground shade
“ “ “ 6 “ 15%) “ “ “ “ “
“ “ “ 7 “ 0) Maximum response to fertilizers
Under these conditions

Fertlizer requirements :- A general guide based on the requirements of the crop, Soil type,and rainfall.

(a) Establishment phase of the plant (First 4 years)

1st Year....1 lb per plant Calcium ammonium Nitrate or Sulphate of Ammonia at start of rainy season.Apply in a ring around the plant not wider than the spread of the branches.Weed plants before applying fertilizer

2nd YEAR……… 2 lbs per plant in split applications of any of the following NPK mixtures :- 12:8;24, 12:12:30 or 11:11:33. The first at the beginning of the rainy season in June.The second around Oct.—Nov.

3rd and 4th Year ...... 3 lbs per plant of any of the above mixtures .. Apply similarly in split application

Productive phase of plant –5th year onwards,plant should have already commenced bearing

5th & 6th Year....... 4 lbs per plant of any of the above mixtures.Apply similarly in split application.

7th Year ....5 lbs “ “ “ “ “ “ “ “ “ “ “ . “ increasing annually by one pound per annum up to an average of about 10 lbs/plant

Pruning:- This is one of the most important cultural practice which is ignored by many farmers.Pruning admits light into the thick canopy of the plant and increases the capacity and photosynthetic activity of the inner canopy.It shapes the tree and provides a scaffold of lateral branches on which to hang the crop which is mainly borne on the tips of these branches.After flowering, it takes about nine months for pod development to maturity. Under Grenada conditions,nutmeg seem to have two peak production periods. Feb,-April and July-Dec. Pruning should be done when the crop is out and just before fertilizer application.

Diseases:-Nutmeg plants are relatively free from any serious insect pest.However the following four fungal diseases are of varying importance.(9)

(a) Mace Scab:-This is a whitish callous-like outgrowth on the mace which affects the development of its red pigment, making it unsightly .Microscopic and histochemical tests suggest that the scab may be due to an accumulation of calcium oxalate and this needs to be confirmed by further research.

(b) Greasy Spot:- This is due to the occurrence of dark brown greasy raised lesions on the leaves near the veins.The disease is associated with several saprophytic fungi and can be controlled by a copper fungicide.

(c) Thread Blight:- Caused by a Corticium spp fungus.It is not a serious disease and can be controlled by a copper fungicide

(d) Nutmeg Wilt:- This is the most serious disease of the nutmeg plant.The leaves lose their turgidity and turn brown before falling ,and the pods appear wrinkled and dehydrated before the tree dies.Both young and old trees succumb to the disease which is widespread in Grenada.It is thought to be due to a species of the Rossellina fungi which also attack cacao,breadfruit and avocado.More recently ,it is thought that other fungi are also involved. Trees tend to die sporadically or sometimes adjacent to each other .Contact appears to be made through their roots.Control method locally is by Trench Isolation, wherby a deep drain is dug around the infected tree to sever its roots, after which it is burnt.White lime is then applied to the soil around its base.Control by injecting a systemic fungicide into the stem of infected trees is currently being investigated.

Research and Development

Research in a scientific discipline as Agriculture can be classified either as Basic Research or Applied Research. Both are important to the advancement of human knowledge,but they have different goals.Basic Research may be conducted to gather Information or build on existing knowledge,while Applied Research is designed to solve a practical problem (e.g the vegetative propagation of female nutmeg plants) rather than acquiring knowledge for knowledge sake in Basic Research.
The lines between both types of Research are not always clear as has been some of the work done by the U.W.I in a Nutmeg Research Program(1966-1969) for the GCNA.

In March 1966,the Association agreed to contribute EC.$4,800 annually to the cost of a program for the production and processing of nutmeg in Grenada .It was directed by the Professor of Agriculture (Crop Production)who prepared the plans in consultation with the GCNA and the Ministry of Agriculture,Grenada.(13)
The initial phase of the program consisted of the following:-

(a) Field survey of Nutmeg trees in Grenada with a view to selection of superior types for multiplication.
(b) Studies of factors related to quality in nutmeg and mace
(c) Arrangements with Tropical Products Institute,London to conduct nutmeg analyses to trace differences in essential oils and other constituents which may be affected by environmental or agronomic treatment of trees.
(d) Investigations of female and male nutmeg flowers Including pollination mechanism, to determine whether self pollination occurs in Bi-sexual flowers and whether there can be fruit development in the absence of pollination in unisexual female flowers.
(e) Bio-chemical studies on the quality of West Indian Nutmeg
(f) In 1965 two studies were conducted,one on the cost/yield of nutmeg and the second in conjunction with the Brace Institute of McGill University, on the possibility of expanding the production of nutmeg preserves.(14)
(g) In 1969 the Ministry of Overseas Development operated a Pilot Plant to determine the feasibility of extracting nutmeg oil.This study ended in 1971 and concluded that it was possible to produce a commercially acceptable quality of nutmeg oil locally.
(h) In 1970 the GCNA purchased some equipment for manufacturing jams and Jellies

Nutmeg Research conducted by “The Windward Islands Research And Educational Foundation(WINDREF) of St George`s University.(15)

In December 2004 Windref counducted a seminar at St.George`s University on “The Development of the Nutmeg Industry: A New Perspective”The participants included Stakehoders from the GCNA, The Ministry of Agriculture.CARDI,The UWI and SGU/WINDREF The Seminar discussed :- Nutmeg Production and Field Management, Quality Management,Options for Processing and Diversification and Research.This exercise followed the identification and selection of trees on certain estates a few years earlierThe nuts and mace were separately harvested by the GCNA,processed and shipped to Germany for analysis of the different chemical constituents,including Essential Oils,Myristicin,Saforal etc.

Some of the selected trees were destroyed by Hurricane Ivan in 2005, However in 2007 another selection of trees was made and the Project continues with the trees which survived the Hurricane and some of those recently selected.

Other collaborative Projects(16) involving WINDREF,The Ministry of Agriculture and The GCNA include the following,:-

Occupational Safety and Health for nutmeg workers

Installation of a Solar Dehydrator for the nutmeg processing plant in Gouyave and an assessment of nutmeg replanting efforts to address land degradation

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The Spice Research Project. (17)

This project was initiated in July 2010 with funding from the European Union (EU) when it was called “The Spice Research and Farm System Project”. EU funded was terminated in April 2011 and funding is now provided by Government of Grenada The Administrative Office of the Project is located at Ashenden in St.David`s(The Former Cocoa Station)and the Project Manager is Ronald O`Neale

One of the investigations currently pursued by the Project is a determination of the Physical and Chemical characteristics of the Myristica fragrans nutmeg grown locally.Among other things it would assist in identifying Grenada produced nutmeg and mace by Branding , thus ensuring its protection legally in the international market

The investigation started by identifying and selecting a number of nutmeg trees on the Belle Vue and Belmont Estates and small holdings in St Andrew`s, St.Patrick`s and St.John`s

Some of the Physical Characteristics examined included:-Architecture of trees i.e whether spreading or lanky or cone shaped.Seed size,uniformity,weight, colour,Mace coverage and thickness,weight of Fresh mace,Pod size and thickness,

As regards the Chemical Characteristics,the analysis and determination included the following:-

High Essential oil,Low Safrol,High Myristicin (with seed characteristics)
“ “ “ “ “ “ “
“ “ “ ------------ “ “ (Top 20)
“ “ “ “ “ Low “
Safrole-Myristicin Correlation
Percentage Safrole by Site

Comparison of Essential Oil by site
Comparison of % Myristicin by Site
Chemical Analysis of Nutmeg & Mace

T The analyses were done by a Laboratory in Germany.

The early justification for determining the foregoing is that it would

(a) Justify the Propagation of “local” nutmeg cultivars with known chemical profiles

(b) The marketing of locally produced nutmeg and mace based on chemical analysis, as well as controlling the genetic drift towards undesirable compounds in these products.

Value Added Products(18)

According to the Report of The Commonwealth Secretariat Action Plan, Research and development of new value added products was constrained by a lack of investment capital by the GCNA.This was unfortunate as the processing and development of new secondary and tertiary products from nutmeg and mace was a viable option for increasing incomes and export earnings.The report identified the potential in the following products from:

(a) Pericarp : jam,jelly,pepper sauce,wine,liquer and rum punch
(b) Shells: substrate,brickettes(used as fuel)
(c) Mace: seasonings,jelly
(d) Nut: spice,oils,oleoresins,fat

Between 1985 and 2007 the following nine enterprises were involved in Nutmeg processing:-

De La Grenade ....Jams & Jellies
Arawak Island............Jams,Jellies,Candles,Soaps,etc
Bargauna Enterprise...Nutmeg flavoured honey
W & W Spices............Nutmeg processing plant
Noelville.....................Nutmeg & Agroprocessing(“Nutmed”)
Caribbean Naturals.....Candles and soaps
Blue Reflexion............ Candles,soap, and food processing
Sunlife Aromatic..........Skin care and fragrance products
Belzeb.........................Skin care and fragrance products

These Companies all received some form of incentives at the commencement of their operations and except for “W & W Spices”which has since been bought out by “West India Spice Inc” Noelville , DeLa Grenade Enterprises and Arawak Island, knowledge of the others was not available.

The Produce Chemist Laboratory under the direction of Dr,Guido Marcelle has developed a range of Nutmeg by-products including the following:-(19)

Nutmeg syrup,Candied nutmeg pods,Nutmeg pods in syrup,Nutmeg pods puree,Nutmeg jelly,Nutmeg jam,Nutmeg mixed jams(i.e Nutmeg with other fruits),The use of nutmeg and mace in formulating a variety of seasoning products. To transform these items from the experimental state to commercially viable marketable products ,require in depth promotional efforts, the exploration of joint ventures ,as well as high quality and safety standards in production.

In the development of most successful industries, there would be many persons ,some named or un-named, who have significantly and quietly contributed to this success.In other words, they do not sing their praise.As a result ,their contribution is not well known, nor recognised, especially if it is not in the public domain.For example ,not many Grenadians today know of the many verbal battles fought by T.E.Noble Smith in and out of the Legislative Council in support of the establishment of the GCNA .We should not allow this situation to continue.Therefore this Historical Overview of Grenada`s Nutmeg Sector wishes to recognise the significant contribution made by three local scientists to the development of the sector, or who are associated with its development as the case may be.They are :-Dr.Guido Marcelle, Mr Leonard St.Bernard and Mr.Ronald O`Neale.

Dr.Guido Marcelle

Guido`s interest in the development of the Nutmeg Sector predates his 24 years(1986-2010) employment with the Produce Chemist Laboratory(PCL).In those early years, he looked at the nutmeg plant in its totality, envisaging the utilization of all its parts from a knowledge of Botany and Chemistry.

Apart from his investigations at the PCL indicated above(19),he was also Involved In the following :-

The experimental distillation of nutmeg essential oil by steam distillation In the PCL

The utilization of some value added products as starting materials and mixes for other food products.

The formulation of spice and seasoning products from nutmeg and mace for the Minor Spices Cooperative et alia.

Purification and clarification of nutmeg butter(fat),from the distillation by-products of the GCNA plant at Marli(St.Patrick`s) to generate new products e.g, liquid soap

Facilitated the collaboration of the P.C.L in the FAO Round Table on the Development of Aromatics and Spices,Handling,Packaging,Quality Control and Marketing in Caricom,held in Grenada in Oct. 1993

The following Publication emerged from the above Proceedings.

“ Production,Handling,and Processing of Nutmeg and Mace and their Culinary Uses “ By Guido Marcelle, 1995

Provision of support to the production of nutmeg based products e.g “NUTMED” ,and the testing of nutmeg and mace for export by GCNA.

Following the destruction suffered by the Nutmeg Sector from Hurricane Ivan,Guideo was appointed Chairman of “The National Coordinating Committee Grenada Nutmeg Sector Development Strategy.

The development plan for the revitalization of the local Nutmeg Sector Included a Study Tour by a Technical Team to India from 8-17 Sept 2011 which was initiated and funded by the International Trade Center.The Team comprised:-

Dr.Guido Marcelle—Chairman,National Coordinating Committee
Mr.Denis Noel—representing the Private Sector
Mr. Franklyn Salim—representing farmers
Mr. Marlon Clyne—Manager GCNA
Mr, Garnet Williams—Operations Manager GCNA
Mr. Ronald O`Neale—Manager Spice Research Project

A comprehensive report has been issued on the Study Tour which among other things includes a wide ranging number of recommendations and aspects of Nutmeg technology and practices which can be adopted locally, including the following:-.

Plant propagation techniques to facilitate population recovery and a scientific approach in replanting nutmegs as it relates to particular cultivars

-- The training of farmers and the quality of information transfer
. -- Revisiting the modalities for packaging spices
-- The identification and successful implementation of Joint Verntures.

Mr. Leonard St.Bernard

Leonard`s involvement with the Nutmeg Sector began at the UWI. while doing Post Graduate research in Chemistry,he came across some published literature which highlighted the significant difference between nutmegs grown in Grenada and that of its Eastern counterparts.For several years after,he read every piece of literature and conducted several experiments on Grenadian nutmeg to optimize the yield and quality of the oils.He then worked briefly with the GCNA before obtaining financial backing for his dream idea of creating value added products from nutmegs.He worked alongside Joel Webb in 2001 to build the largest modernized spice processing plant in the Caribbean(W&W .Spices).He is also the co-holder of a U.S patent for G.N.O. Pain Relieving Oil.and the owner of a Nurmeg Estate where he is cultivating various spices.Followng the closure of W&W Spices In 2005 due to Hurricane Ivan,Leonard worked with the FAO developing and facilitating various agro-processing and agricultural Projects.In 2011 Leonard and his family purchased W&W Spices, renaming the Company West India Spices Inc.specializing in the Production of essential and fixed oils from nutmeg and other spices. He is a former student of Dr.Dilon Daniel,a well known Grenadian Chemist and Researcher on nutmegs, and was a close associate of the the late George Brizan who had a great influence on him in the field of Nutmeg Research.

Ronald O`Neale

Ronald graduated in 1985 from the Higher Institute of Agricultural Sciences,Havana, Cuba,with a BSc in Agronomical Engineering ,and in 1994 with an M.Sc in Tropical Horticulture and Plant Science from Wye College,University of London,England

From 1986-1996 he was employed as an Agronomist with the Ministry of Agriculture with responsibility for Vegetable and Root Crop development. Between 1996 and 2010 ,he was engaged by Seminis Vegetable Seeds Inc.based in California USA ,as Product Development Specialist for the Caribbean region.Ronald is currently the Manager/Team leader of the Spice Research Project of the Ministry of Agriculture,to which he has brought a high level of academic discipline and experience.

The Principal objective of the Project can be summarized in the following sentence:-“The Revitalization of the nutmeg and spice Industry in Grenada” The expectation therefore is an improvement in Grenada`s competiveness in spice production, through the use of improved production technology in nutmeg and other spices,to promote increases in foreign exchange earnings and farm incomes

Some of Ronald`s early work in the Project is indicated at(17) above.and he is continuing the selection of improved cultivars of nutmegs and other spices as cloves and cinnamon etc to be used as parent material for future propagation..As regards the chemical analyses referred to above(17), 121 samples have been done to date.This activity is expected to continue locally,as the Produce Chemist Laboratory and the Bureau of Standard are now equipped to perform this function.

“Germplasam banks”(17) will be established at Belle Vue and Grand Bras Estates,to study the performance of nutmeg and other spices with varying characteristics which can be used in future breeding and improvement Programmes

Further work would continue on propagating nutmeg epicotyl grafts.The Project has produced some 275 plants,(10)some of which would be used to Study their performance in demonstration plots at Belle Vue and Bras Estates,and some distributed to nutmeg key farmers for the same purpose. These plots would be established during the 2012 planting season.However more emphasis would be placed on the patch budding of male nutmeg plants with female “bud-wood” to accomplish a sex change.This is widely practised in India and was observed by the Technical Team which visited that country in September 2011.The technology is now being introduced to Grenada,and it will be used on young seedlings in the nursery as well as older male declared plants in the field.This will change the logistics of planting 2 or 3 plants in close proximity and eliminating all the male plants when they declared after 6 or 7 years.

A training programme on patch- budding is currently in progress , and the technique is expected to be implemented by the fourth quarter of 2012.

CONCLUSION

The 50 year period between Hurricane Janet in 1955 and Hurricane Ivan/Emily in 2004/2005 may or may not be significant nor fortuitous in terms of time.What is significant is the resilience of the Nutmeg Sector after 1955,and like the Phoenix Bird of Greek mythology which self destruct itself by burning and then arise from its ashes , symbolic of its rebirth, renewal and immortality.The Nutmeg Sector after suffering an

80% destruction of its productive capacity was able through the then Hurricane Rehabilitation Programme to rise from the “ashes of Hurricane Janet” and achieve its pre-hurricane production level ,averaging some 5 million pounds (after 25 years) in 1976/80,with an exceptionally high of 6.0 million pounds in 1977 alone.(20)

This achievement was due to the dedicated work of the following stakeholders:- The nutmeg farmers,The GCNA Management and Directors,The Technical Staff of the Agronomy and Extension Divisions of The Ministry of Agricultue,The Techninal Saff of The Windward Islands Banana Association and their Local Counterparts,The Ministry of Finance and the dynamic Leadership of the Hurricane Rehabilitation Commissioner.

The current Nutmeg Rehabilitation Programme being implemented by The Spice Research Project is more extensively structured than that of 1955.Apart from investigating new propagation techniques, work is also being done on the chemical and physical characteristics of the nutmeg ,the establishment and assessment of“germplasam banks” of different spices,all with a view to the future use of the data for sectoral development of the species.Applying the story of the mythical Phoenix as above ,the Sector should also arise from ” the ashes” of Hurricane Ivan/Emily as an evidence of its immortality ,assuming it would receive a comparable level of support as that of Hurricane Janet.A few of the institudinal stakeholder have left “the field”but the principal players like the Farmers,the Extension Division,the GCNA and the Ministry of Finance are still around and the Nutmeg Rehabilitation Programme would now be led by the competent Manager / Team Leader of The Spice Research Project instead of a Hurricane Rehabilitation Commissioner.

AS regards the nutmeg replanting programme,it is indicated that a mixture of some 18,000 seedlings(Malayan and Indonesian/Banda types) would be ready for distribution in June 2012.It is also understood that an estimated 70,000 nutmeg seedlings(equivalent to 1400 acres)were planted by farmers beteen 2005 and 2012.The fact that the nutmeg plant originated as a Tropical rain forest species from its centre of origin is often ignored in the commercialization of the crop.Thus planting sites are not carefully selected in terms of soil condition,rainfall,elevation susceptibility to wind damage etcThus.windswept areas should be avoided except it is possible to establish windbreaks .Temporary shade should be established on the selected site and soil conservation measures should be addressed if necessary .Preparation should begin at least one year in advance of planting.About a month before ,the site should be lined and the holes properly prepared. This is a clinical approach andThe Extention Division has to “BUY-IN” to the Nutmeg Replanting Programme ,advising and closely guiding the farmers along the foregoing lines and those indicated at (11) and (12) above.Recovery of the Sector is somewhat challenging, but it should take less than the 25 years taken after Hurricane Janet if all the Stakeholders accept the challenge.Some eight and a half years have already gone and they should urgently review the current performance of the Sector to ensure that It will indeed arise in less than 25 years from “the ashes of Hurricane Ivan/Emily” like the mythical Phoenix bird.

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References

Brizan,George (7) Grenada`s Black Gold

Cruickshank,A.M (5) A Historical Overview of Grenada`s Cocoa Industry
...........................(9)   Some Aspects Of The Nutmeg Investigation Program in
Grenada(1966)
Commonwelth Secretarate Diognistic Mission(10) 1966
Cruickshank,A.M (12) Extension Bulletin—The Cultivation Of Nutmegs With Special
Reference To Marcots
Commonwealth Secretariate Diognostic Mission(18)

Flach,M, Agric.University,Wageningen,The Netherlands & Cruickshank,A.M.
Dept.Of.Agriculture,Grenada,West Indies(1) “Nutmeg”
..............(2) Nutmeg Cultivation and Its Sex Problem

Groome,J.R(3) The Nutmeg Story
Grenada Handbook & Directory 1966(6)

Koenig,Machan(20) Economic Review of The Agricultural Sector of Grenada(1982)

Martin,john,Angus(4) A-Z of Grenada Heritage
Marcelle, Dr.Gideo(19) Personal Communication

Nichols,R Faculty of Agriculture,UWI,Trinidad & Cruickshank,A.M
Dept.of Agric.Grenada, West Indies(8) Vegetative Propagation of Nutmeg
(Myristica fragrans)

Report of Commission of Inquiry into GCNA (14) 1971

Spice Rresearch Project(17) Personal Communication

Tai,E.A .(13) The Nutmeg Research Programme(1966-1969) Dept.of Crop Science
(UWI) Personal Communication.

Windward Islands Research & Education Foundation(Windref) Seminar on The Devlopment of The Agricultural Sector(15) Dec 2004.

Windref 2011 Annual Report(16) .

Vernon,K.Payne,H.Spector,J (11) Soil & Land-Use Surveys No.9, Grenada.The Regional Research Centre(ICTA)

Addendum

The issue of nutmeg plant establishment and field management and some guide lines to address the problem were pointed out on pp 6 and 7 above.Allied to the foregoing is the importance of site selection, and this is being introduced by reference to the maps on the following pages which have been reproduced by CARDI from the “Soil and land use survey of Grenada”cited above at (11)and published in 1981 in their Agricultural Profile(No.6) of Grenada.On page (19) there are three maps of Grenada depicting “Climate” “Parent Materials” and “Soils”while the map on Page (20) depicts “Vegetation”

The two soils recommended for growing nutmeg are the Capitol Clay loam,Nos.30 and 31(The Red Latosolics/Red Earths on the Soil Map)occurring over highly weathered basic igneous rocks and the Belmont Clay loam,Nos.40 and 41(The Brown Earths on the Soil Map)occurring over basic ash and agglomerate.The normal soils of each are mainly in the higher rainfall areas.The Capitol Clay Loam(The Red Earths) is more extensive than the Belmont Clay Loam(The Brown Earths)

The natural habitat or the Ecology of the Nutmeg plant is the Tropical Rain Forest,therefore in its commercial development, these environmental requirements should be replicated as far as possible ,CARDI seem to have reproduced its “Climate” map from that in the original RRC Soil Survey Report where it is referred to as “The Land Humidity of Grenada”.There are slight differences in the symbols of both maps,but as shown below, the differences in the classification of the seasons are wider in The RRC Soil Survey Report.

CARDI`s Climate Map(A)	The RRC Soil Survey Report(B) Land Humidiy of Grenada
Strong Dry Season(Below 1500mm)	6-7 Dry Months,very strong season
Moderate Dry Season(1500mm-2000mm)	4-5 Dry Months-intense dry season
Weak Dry Season(2000mm-3000mm)	3 Dry Months-marked dry season
Continuously moist or wet(over 3000mm)	2 Dry Months-weak dry season
	< 2 Dry Months-very weak dry season

Despite the difference in the presentation above,the isohyet or rainfall line illustrating areas of equal precipitation in the RRC Soil Survey Report is similar to that in Cardi`s map. with the rainfall increasing inwards in an unorthodox concentric pattern from the coastal areas which receive about 50-60 ins, p.a as compared to the centre of the island which receives some 140-160 ins,p.a

The description of the vegetation in Cardi`s “Vegetation Map”(A) on page 19 and (B) that in the RRC Soil Survey Report re” Natural Vegetation of Grenada” are quite similar as shown below.

CARDI`s Vegetation Map (A)	The RRC Soil Survey Report (B) Natural Vegetation of Grenada
Subclimax	
Mangrove Woodland	
Climatic Climax	
Montane	Climatic Climax
Elfin Woodland	Seasonal
Lower Montane Rain Forest	Evergreen&Semi-Evergreen Seasonal Forest
Deciduous Seasonal Forest	Deciduous Seasonal Forest
Cactus Scrub	Montane
Deciduous Seasonal Forest	* Elfin Woodland
Cactus Scrub	* Montane & Lower Montane Rain Forest
Disturbance Climax	* Disturbance Climax
Palm Brake	* Palm Brake
(Hurricane Forest)	* (Rain Forest Types)

The sustainability of the nutmeg plant locally for almost 170 years has been due to the presence of the ecological requirement of the crop.This is exemplified by the following(i)The Capitol and Belmont Clay loam soils are developed from volcanic parent materias,and are regarded locally as the best “nutmeg soils” They are both moderately well drained and if properly managed ,are responsive to soil amendments etc(2)The adequacy and distribution of the 100-120 ins annual rainfall required by the plant.(3)The elevated protected valleys and mountainous topography (7oo-1200 ft) where the plant is grown.

This appears to be two belts.An upper one extending from about 900-1200 ft into the Elfin Woodland(stunted forest trees)and the Lower Montane Rain Forest.These would be areas experiencing a very weak dry season with less than two dry months.The lower belt extends from about 700-900ft and covers areas experiencing a weak dry season with two dry months.The crop may peak at different times of the year in these two belts as influenced by the weather.

One of the major problem faced by the sector is haphazard establishment of plants in the field and their subsequent care and attention after planting. There is an urgent need for the packaging of a programme of best field management practices of the crop, and the training of both the farmers and the Extension Staff to enable them to sing from the same Hymn Sheet.This is urgent, and the Stakeholders should ensure its immediate implementation as it should have been done before the start of the planting season,but better late than never. As previously indicated, the most productive period of a nutmeg tree is between 15-30 years and although production declines thereafter,plants can still be producing at 80 years.With good field management practices,it is possible to achieve an average annual production of not less than 1000 ibs of dry shelled nutmeg per acre, and about 150 lbs of dried mace.At this level, the Sector should be able bounce back to its pre Hurricane Ivan/Emily production of 6.4 million pounds in two decades, as predicted by some “Nutmeg Industry Watchers”.

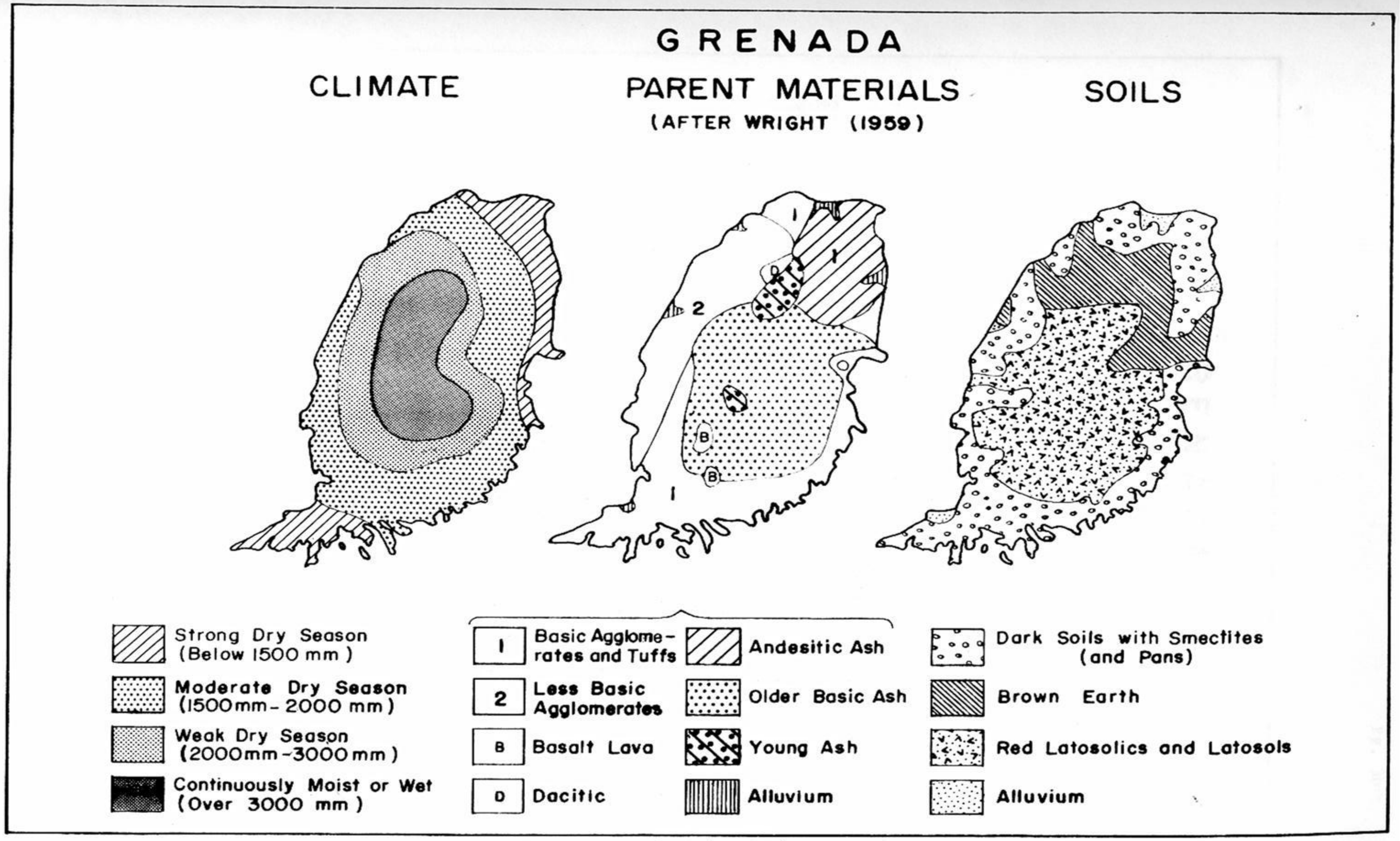
GRENADA
CLIMATE
PARENT MATERIALS
(AFTER WRIGHT (1959)
SOILS
1
2
B
Strong Dry Season (Below 1500 mm)
Moderate Dry Season (1500mm - 2000 mm)
Weak Dry Season (2000mm - 3000 mm)
Continuously Moist or Wet (Over 3000 mm)
1 Basic Agglomerates and Tuffs
2 Less Basic Agglomerates
B Basalt Lava
D Dacitic
Andesitic Ash
Older Basic Ash
Young Ash
Alluvium
Dark Soils with Smectites (and Pans)
Brown Earth
Red Latosolics and Latosols
Alluvium

Fig. 3. (a, b & c)

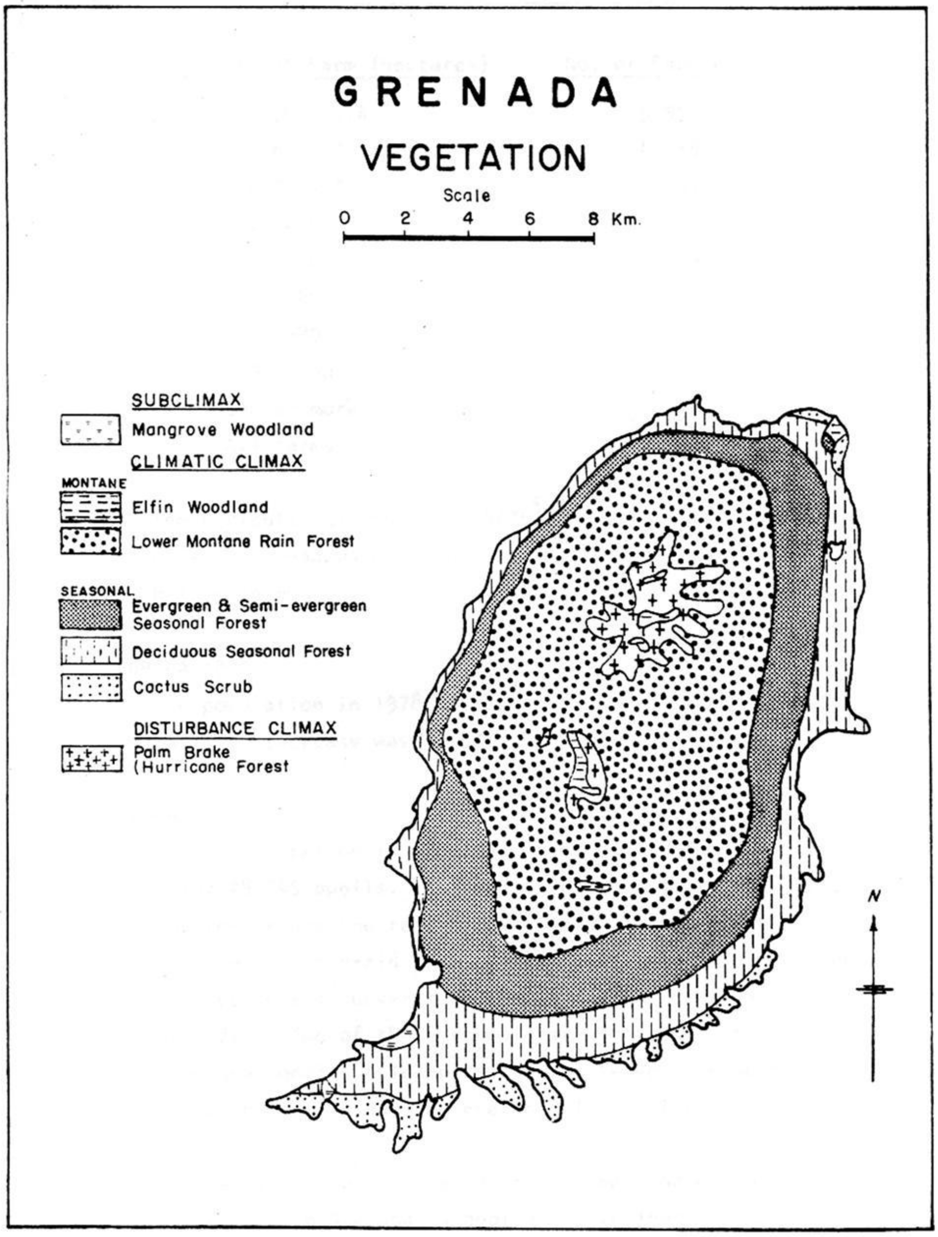
GRENADA
VEGETATION
Scale
0 2 4 6 8 Km.
SUBCLIMAX
Mangrove Woodland
CLIMATIC CLIMAX
MONTANE
Elfin Woodland
Lower Montane Rain Forest
SEASONAL
Evergreen & Semi-evergreen Seasonal Forest
Deciduous Seasonal Forest
Cactus Scrub
DISTURBANCE CLIMAX
Palm Brake (Hurricane Forest
N

Fig. 4.